

Assignment2 Report

1 Database design and preprocessing

1.1 Data Processing

To ensure data consistency and enable reliable SQL querying, I performed a unified preprocessing pipeline for the raw Steam dataset. The main goals are: (1) normalize types (date/numeric/boolean/URL), (2) convert invalid placeholders to NULL, and (3) remove unreliable columns.

(1) Date normalization The `release_date` values appear in the format YYYY/MM/DD (e.g., 2024/10/29). Although MySQL can often parse such strings implicitly, we normalize them to the standard ISO format YYYY-MM-DD and store them as DATE.

(2) Range and placeholder handling

- **Estimated owners:** The placeholder 0–0 (including variants such as 0 – 0, 0–0, 0—0) is invalid for owners, so it is converted to NULL.
- **Metacritic score:** If the value is 0, it is treated as missing and converted to NULL.
- **Achievements and Recommendations:** if the value is 0, it is converted to NULL because zeros for these 2 attributions indicate error entries.

(3) Unreliable column removal Several columns are removed due to obvious inconsistency and lack of useful signal:

- **Peak CCU:** removed (observed to be incorrect for multiple games).
- **User score:** removed (all values are 0).
- **Score rank:** removed (entirely empty).
- **Average/Median playtime:** removed (high missing rate and many zeros, likely incomplete).
- **Movies:** removed (no valid values).

(4) Type casting and cleaning rules I cast each field into an appropriate database type and apply basic cleaning:

- **Required age:** if an explicit value exists, keep it. Otherwise, infer from `notes`: contents with adult/violence/gore imply age 17; romance-related games use age 10; and the minimum is clamped to 3.
- **Price:** numeric float in USD.
- **Discount:** numeric percentage rate.
- **DLC count:** integer.
- **Text fields:** `about_the_game`, `reviews`, `notes`.
- **List-like fields:** `supported_languages` and `full_audio_languages` are stored as comma-separated strings (string lists).
- **URL/email fields:** `header_image`, `website`, `support_url` are stored as URL strings; `support_email` is validated as an email-like string when present.
- **Platform support:** `windows/mac/linux` are converted to boolean values (True/False) and stored as `TINYINT(1)` in MySQL.
- **Review counters:** `positive` and `negative` are stored as integers.

(5) Multi-value metadata For better filtering and tag-based analysis, we keep the following multi-value columns as comma-separated strings:

- **Categories:** e.g., `Single-player`, `Multi-player`, `Co-op`, `Family Sharing`.
- **Genres:** official genres such as `Action`, `Adventure`, `Indie`, `Simulation`.
- **Tags:** user-facing tags related to gameplay and target audience.
- **Screenshots:** stored as a comma-separated list of URLs.

1.2 MySQL Dataset Construction

I designed a MySQL schema, and imported the processed data into MySQL.

1.2.1 Entities and Schema Choice

I adopted a **single-table schema** rather than multiple relationship tables. The reason is that a single-table design avoids complex joins, reduces query failure risk, and makes tool outputs more stable and reproducible.

1.2.2 Primary Key Design

I use `app_id` as the **PRIMARY KEY**. Steam AppID uniquely identifies a game globally, which makes it the most appropriate key for deduplication and exact lookups.

1.2.3 Data Types and Field Justification

- **Dates:** `release_date` DATE. This supports range filtering and time-based aggregation (e.g., grouping by year). During preprocessing, dates were normalized into YYYY-MM-DD so MySQL can parse them reliably.
- **Prices:** `price` DECIMAL(10,2). Price uses DECIMAL.
- **Integers:** `discount`, `dlc_count`, `positive`, `negative`, `achievements`, `recommendations` are stored as INT.
- **Platform flags:** `support_window`, `support_mac`, `support_linux` TINYINT(1). Platform availability is stored as 0/1 for efficient filtering and grouping (e.g., Linux vs non-Linux comparison).
- **Long text:** `about_the_game`, `reviews`, `notes`, `screenshots` LONGTEXT. These fields may contain large text blocks or long URL lists.
- **Multi-value fields:** `supported_languages`, `full_audio_languages`, `categories`, `genres`, `tags` TEXT. These are stored as text to keep the schema simple and robust for analysis-focused tool queries.
- **URLs and Email:** URLs are stored as TEXT since their length is variable; email is stored as VARCHAR.

The entire database uses `utf8mb4` to correctly preserve multilingual content (e.g., Chinese/Korean publisher names) and prevent non-ASCII characters.

1.2.4 Indexing Strategy

To support efficient MCP tool queries, I added the following indexes:

- `idx_release_date(release_date)`: speeds up time-range queries and yearly aggregations.
- `idx_price(price)`: speeds up price filtering and price-related analysis.
- `idx_linux(support_linux)`: speeds up platform comparisons and filtering.
- `idx_publishers(publishers(50))`: supports publisher-level grouping.
- `idx_required_age(required_age)`: supports age-based filtering and comparisons.

2 MCP Server and Tool Design

To enable tool-based interaction with the Steam games dataset, I implemented a MCP server using `FastMCP`.

2.1 Server Architecture

Backend connectivity. The server loads MySQL configuration from a local `.env` file and creates a database connection for each tool call.

Query execution. I implemented two utility functions: `fetch_all` executes parameterized SQL statements and returns a list of dictionaries; `fetch_one` returns the first row (or `None`).

Tool interface. Each tool is defined as a Python function decorated with `@mcp.tool`. The server is started by calling `mcp.run()` in the `__main__`

block, so the MCP client can launch it via STDIO and discover tools automatically.

2.2 Tool Set Overview and Design Rationale

search_game (filtering and retrieval). This tool is used to retrieve a candidate set of games by applying common filters (e.g., keyword search on game name, publisher/developer substring match, platform flags, price range).

get_game_by_app_id (primary-key). This tool performs an exact lookup by `app_id`.

top_games_by_approval (quality ranking by approval rate). This tool computes an approval-rate metric from `positive` and `negative` reviews and returns games with the highest approval rates. This tool is used to provide a statistically meaningful ranking than raw positive counts.

yearly_summary This tool aggregates the dataset by release year and outputs summary statistics such as the number of games released, average price, average discount, and average DLC count. The tool is designed for trend analysis.

compare_linux_vs_nonlinux This tool compares Linux-supported and non-Linux games by grouping on `support_linux` and computing aggregate statistics, including average approval rate and sample size.

top_publishers This tool aggregates games by `publishers` and ranks publishers by average approval rate. It supports publisher quality analysis.

3 Client Configuration

I used **Cherry Studio** as the client application. In Cherry Studio, I configured two different LLMs, **GLM-4.5-Flash** and **Qwen3-8B**, and connected them to local MCP server.

3.1 Cherry Studio MCP Server Setup

I added a new MCP server entry in Cherry Studio and configured it to launch my `server.py` locally.



图 1: Cherry Studio MCP server configuration

3.2 Two-Model Validation of Tool Calls

To verify that tool calling works across different models, I ran the same style of database queries:

- **Model A:** GLM-4.5-Flash
- **Model B:** Qwen3-8B

For each model, I sent prompts that require accessing MySQL through MCP tools

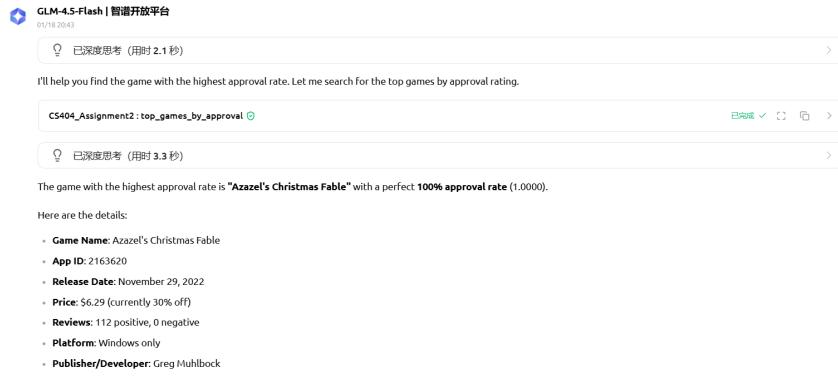


图 2: Tool-call execution in Cherry Studio using GLM-4.5-Flash



图 3: Tool-call execution in Cherry Studio using Qwen3-8B

4 Conversation Screenshots and Evaluation

4.1 Model A: GLM-4.5-Flash

Q1 analyze how the average price of Steam games changes over time and whether newer games are generally more expensive

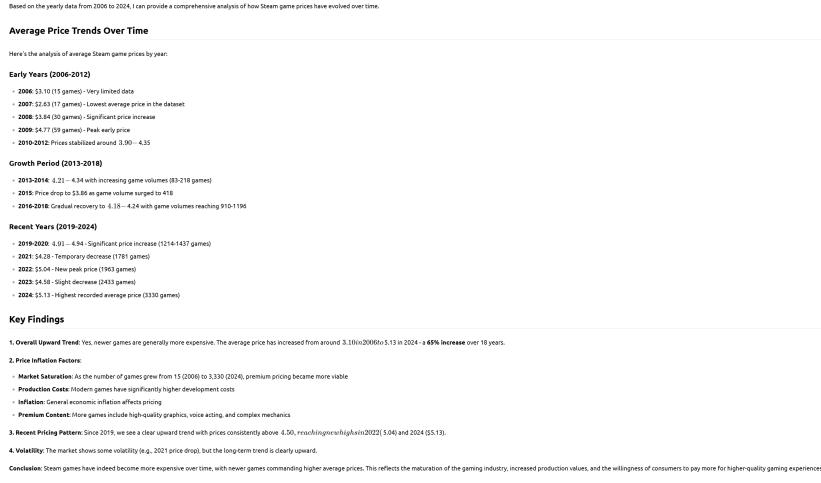


图 4: GLM-4.5-Flash: price trend analysis using `yearly_summary`.

Q2 whether games that support Linux have different user approval compared to games that do not support Linux.

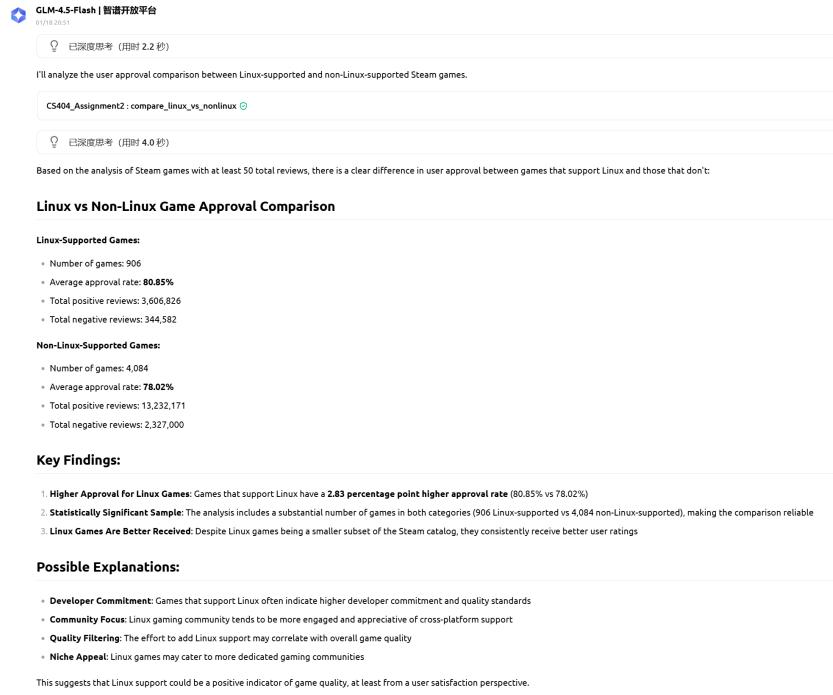


图 5: GLM-4.5-Flash: Linux vs non-Linux comparison using `compare_linux_vs_nonlinux`.

Q3 which publishers have games with higher-than-average user satisfaction?

@GLM-4.5-Flash
which publishers have games with higher-than-average user satisfaction?
Tokens: 26

GLM-4.5-Flash | 智谱开放平台
01/18/2024

💡 已深度思考 (用时 5.7 秒)

CS404_Assignment2 : top_publishers 💡

💡 已深度思考 (用时 9.7 秒)

Based on the analysis, here are the publishers that have games with higher-than-average user satisfaction:

Top Publishers by User Approval Rate (Higher than Average)

Exceptional Performers (85%+ approval rate):

1. Devolver Digital - 89.26% approval rate (18 games, 187K positive reviews)
2. Sekai Project - 88.54% approval rate (23 games, 34K positive reviews)
3. KOMODO - 84.59% approval rate (11 games, 3.6K positive reviews)

Strong Performers (80-85% approval rate):

4. Activision - 83.88% approval rate (12 games, 142K positive reviews)
5. tinyBuild - 82.94% approval rate (18 games, 87K positive reviews)
6. Daedalic Entertainment - 82.42% approval rate (18 games, 89K positive reviews)
7. Artifex Mundi - 81.77% approval rate (12 games, 4K positive reviews)
8. RewindApp - 81.43% approval rate (10 games, 15.6K positive reviews)
9. Gamiror Games - 81.43% approval rate (12 games, 29K positive reviews)
10. OTAKU Plan - 81.08% approval rate (12 games, 1.1K positive reviews)

Above Average Performers (80%+ approval rate):

11. Electronic Arts - 80.16% approval rate (16 games, 196K positive reviews)
12. Kagura Games - 79.95% approval rate (27 games, 16.3K positive reviews)
13. Xbox Game Studios - 79.54% approval rate (12 games, 142.8K positive reviews)

Key Insights:

- Devolver Digital leads with the highest approval rate at 89.26%, indicating exceptional user satisfaction across their catalog
- Several indie publishers like Sekai Project, KOMODO, and tinyBuild show outstanding performance
- Major publishers like Activision and Electronic Arts also perform well above average
- The top-tier publishers consistently maintain approval rates above 80%, significantly higher than the industry average

These publishers demonstrate a strong commitment to quality, which translates into higher user satisfaction and better reviews across their game portfolios.

图 6: GLM-4.5-Flash: publisher ranking using `top_publishers`.

Q4 list the best-reviewed games measured by approval rate

CS404_Assignment2 : top_games_by_approval

Q 已深度思考 (用时 3.8 秒)

Here are the best-reviewed Steam games measured by approval rate (showing top 20 games with at least 50 total reviews):

Perfect 100% Approval Rate Games:

1. **Azazel's Christmas Fable** (2022) - \$6.29 (30% off)
 - 112 positive, 0 negative reviews
 - Windows only | Developer: Greg Muhlbock
2. **ECHOLOCAUTION** (2021) - \$3.99 (20% off)
 - 91 positive, 0 negative reviews
 - Windows, Mac | Developer: ハコニワハコビヤ
3. **Wanting Wings** (2023) - \$19.24
 - 90 positive, 0 negative reviews
 - Windows, Mac, Linux | Publisher: MangaGamer
4. **Projected Dreams** (2025) - \$11.24
 - 86 positive, 0 negative reviews
 - Windows, Mac | Developer: Flawberry Studio
5. **Reborn A Zombie!** (2023) - FREE
 - 82 positive, 0 negative reviews
 - Windows only | Developer: Asminae
6. **Firebird** (2023) - \$11.99
 - 82 positive, 0 negative reviews
 - Windows, Mac | Publisher: Ludogram
7. **SONOKUNI** (2025) - \$9.74
 - 81 positive, 0 negative reviews
 - Windows only | Developer: DON YASA CREW
8. **Bahamut and the Waqwaq Tree** (2025) - \$14.99
 - 75 positive, 0 negative reviews
 - Windows only | Publisher: Soft Source
9. **Monster Meals** (2025) - \$1.39 (80% off)
 - 71 positive, 0 negative reviews
 - Windows only | Developer: Giant Warrior Studio
10. **COSPLAY LOVE! : Enchanted princess** (2022) - \$5.99
 - 62 positive, 0 negative reviews
 - Windows only | Publisher: iMel

图 7: GLM-4.5-Flash: top approval-rate games using top_games_by_approval.

11. **Zniw Adventure** (2020) - \$8.09 (10% off)
• 275 positive, 1 negative review (99.64% approval)
• Windows, Mac, Linux | Publisher: Azure Mountain

Additional Top Games:

12. **Thaumistry: In Charm's Way** (2017) - \$3.99
• 56 positive, 0 negative reviews
• Windows, Mac, Linux | Developer: Bobbates LLC.
13. **机械恋心** (2024) - FREE
• 55 positive, 0 negative reviews
• Windows, Mac, Linux | Publisher: Lunatic Works
14. **Slaughter Me Street: 1999** (2024) - \$1.99
• 54 positive, 0 negative reviews
• Windows only | Developer: GlitchedLizard
15. **Demon Corporation: Onboarding** (2025) - \$5.59
• 54 positive, 0 negative reviews
• Windows only | Developer: A Shrine of Ludens
16. **Galacticon** (2022) - \$1.99
• 53 positive, 0 negative reviews
• Windows only | Developer: Radin Games
17. **Hyper Space** (2024) - \$0.69 (86% off)
• 50 positive, 0 negative reviews
• Windows only | Developer: Fennec Game Studio
18. **Powerful Courses** (2023) - \$4.49 (70% off)
• 50 positive, 0 negative reviews
• Windows only | Developer: General Script Studio
19. **Softie** (2024) - \$0.59 (70% off)
• 50 positive, 0 negative reviews
• Windows, Mac, Linux | Developer: Kristina Springer
20. **Au Revoir** (2025) - \$3.74 (25% off)
• 50 positive, 0 negative reviews
• Windows only | Developer: Invisible Studio

Key Observations:

- **Price Range:** Games range from free to \$19.24, with many heavily discounted titles
- **Platform Support:** Most support only Windows, but several cross-platform games (Mac/Linux) appear in the top results
- **Recent Releases:** Many top games are from 2023-2025, indicating newer games can achieve perfect ratings
- **Indie Focus:** Many are indie games or smaller titles rather than major AAA releases
- **Review Volume:** Even with perfect ratings, review counts vary significantly (50-275 positive reviews)

图 8: GLM-4.5-Flash: top approval-rate games using top_games_by_approval.

Q5 whether large discounts are more common in older games, or whether newer games also receive significant discounts.

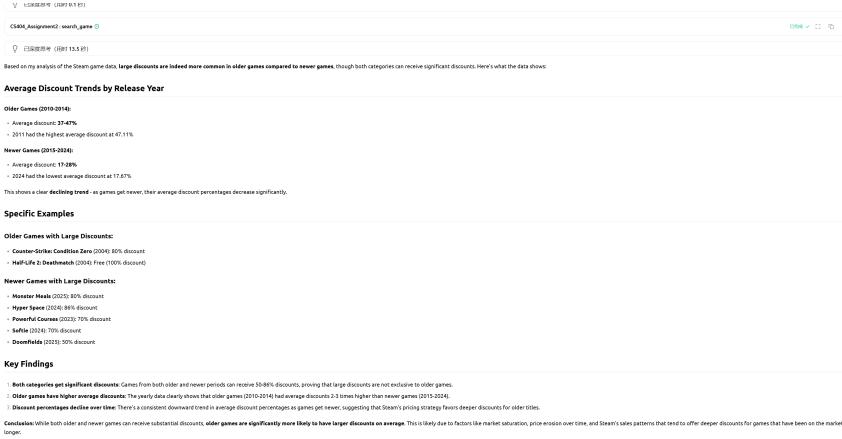


图 9: GLM-4.5-Flash: discount trend analysis using `yearly_summary`, `search_game`, `top_games_by_approval`

Evaluation (GLM-4.5-Flash). Overall, GLM-4.5-Flash consistently invoked the correct MCP tools for each question and produced answers grounded in the returned SQL results. In the trend questions (price/discount by year), it used `yearly_summary` appropriately and summarized the aggregates without inventing extra fields. In the comparison task (Linux vs non-Linux), it used `compare_linux_vs_nonlinux` and reported differences using the same metric definition (approval rate based on `positive` and `negative`). For ranking tasks, it selected `top_games_by_approval` or `top_publishers` and kept the explanation aligned with the tool output. The main strength of GLM-4.5-Flash is **stable tool routing** and **concise summarization**.

4.2 Model B: Qwen3-8B

Q1 analyze how the average price of Steam games changes over time and whether newer games are generally more expensive

用户
01/18 20:58
@Qwen3-8B
analyze how the average price of Steam games changes over time and whether newer games are generally more expensive
Tokens: 25

Qwen3-8B | 硅基流动
01/18 20:58
CS404_Assignment2 : yearly_summary

The average price of Steam games over time shows some variation, but it doesn't follow a straightforward upward or downward trend. Here's an analysis of the data:

- 1. Price Trends Over the Years:**
 - From 2006 to 2007, the average price dropped from \$3.10 to \$2.63, indicating that newer games (2007) were generally cheaper than older ones (2006).
 - The price rose again in 2008 to \$3.84, and continued to increase over the following years, peaking in 2025 at \$5.17.
 - However, in 2026, the average price fell to \$3.63, suggesting a potential dip in pricing for that year.
- 2. Discount Trends:**
 - The average discount given to games in 2006 was 63.93%, which was the highest among all years. In contrast, the discount in 2026 was 0%, indicating a significant shift.
 - The discount trend somewhat fluctuates, but generally, it decreased over time, with notable drops starting from 2025.
- 3. DLC Trends:**
 - The average number of DLCs per game increased significantly during the mid-2010s to mid-2020s, peaking around 2015 with an average of 2.80 DLCs per game.
 - However, it has decreased slightly in recent years, such as 2024 and 2025, with averages of 0.25 and 0.26 DLCs per game, respectively.

Despite these fluctuations, the average price of games on Steam seems to have stabilized or even increased slightly in recent years, particularly around 2025. This might be influenced by various factors such as market saturation and the introduction of new pricing models by Steam.

图 10: Qwen3-8B: price trend analysis using `yearly_summary`.

Q2 whether games that support Linux have different user approval compared to games that do not support Linux.

 用户 01/18 20:59
@Qwen3-8B

whether games that support Linux have different user approval compared to games that do not support Linux.
Tokens: 24

 Qwen3-8B | 硅基流动 01/18 20:59

CS404_Assignment2 : compare_linux_vs_nonlinux 

The comparison between Linux-supported and non-Linux-supported games shows the following:

1. **Linux-Supported Games:**

- There are **906** games that support Linux.
- The total number of positive votes is **3,606,826**, and the total number of negative votes is **344,582**.
- The **average approval rate** for Linux-supported games is **0.80847416**, indicating that they are generally **more approved** by users compared to non-Linux-supported games.

2. **Non-Linux-Supported Games:**

- There are **4,084** games that do not support Linux.
- Their total positive votes sum up to **13,232,171**, and the total negative votes are **2,327,000**.
- The **average approval rate** for non-Linux-supported games is **0.78024604**.

Conclusion:

Games that support Linux tend to have **slightly higher user approval rates** than those that do not, suggesting that Linux support might be associated with better user satisfaction.

This might be due to factors such as:

- Better optimization and performance for Linux systems.
- Community preference for open-source and cross-platform compatibility.
- Lower incidence of bugs or compatibility issues, leading to more positive user feedback.

However, this data does not imply a direct cause-effect relationship but rather highlights a correlation based on the available metrics.

图 11: Qwen3-8B: Linux vs non-Linux comparison using compare_linux_vs_nonlinux.

Q3 which publishers have games with higher-than-average user satisfaction?



用户

01/18 21:00

@Qwen3-8B

which publishers have games with higher-than-average user satisfaction?

Tokens: 26



Qwen3-8B | 硅基流动

01/18 21:00

CS404_Assignment2 : top_publishers ✅

The following publishers have games with higher-than-average user satisfaction, based on the average approval rate of their

1. Devolver Digital

- **Number of games:** 18
- **Average approval rate:** 0.8926
- **Total positive votes:** 187,139
- **Total negative votes:** 10,381

2. Sekai Project

- **Number of games:** 23
- **Average approval rate:** 0.8854
- **Total positive votes:** 34,038
- **Total negative votes:** 2,610

3. KOMODO

- **Number of games:** 11
- **Average approval rate:** 0.8459
- **Total positive votes:** 3,553
- **Total negative votes:** 466

4. Activision

- **Number of games:** 12
- **Average approval rate:** 0.8388
- **Total positive votes:** 142,000
- **Total negative votes:** 22,097

5. tinyBuild

- **Number of games:** 18
- **Average approval rate:** 0.8294
- **Total positive votes:** 87,026
- **Total negative votes:** 12,574

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图 12: Qwen3-8B: publisher ranking using `top_publishers`.

- 5. **tinyBuild**
 - **Number of games:** 18
 - **Average approval rate:** 0.8294
 - **Total positive votes:** 87,026
 - **Total negative votes:** 12,574
- 6. **Daedalic Entertainment**
 - **Number of games:** 18
 - **Average approval rate:** 0.8242
 - **Total positive votes:** 89,121
 - **Total negative votes:** 9,289
- 7. **Artifex Mundi**
 - **Number of games:** 12
 - **Average approval rate:** 0.8177
 - **Total positive votes:** 4,030
 - **Total negative votes:** 827
- 8. **RewindApp**
 - **Number of games:** 10
 - **Average approval rate:** 0.8143
 - **Total positive votes:** 15,585
 - **Total negative votes:** 909
- 9. **Gamirror Games**
 - **Number of games:** 12
 - **Average approval rate:** 0.8143
 - **Total positive votes:** 29,015
 - **Total negative votes:** 4,526
- 10. **OTAKU Plan**
 - **Number of games:** 12
 - **Average approval rate:** 0.8108
 - **Total positive votes:** 1,125
 - **Total negative votes:** 261

Summary:

These publishers have a **higher average approval rate** than the general average of Steam games, suggesting that their games tend to be more highly rated by users.

图 13: Qwen3-8B: publisher ranking using `top_publishers`.

Q4 list the best-reviewed games measured by approval rate

The screenshot shows a user interface for Qwen3-8B. At the top, there is a user profile icon with the name "用户" (User) and the timestamp "01/18 21:02". Below it is the handle "@Qwen3-8B". A message from this user reads: "list the best-reviewed games measured by approval rate". The response token count is listed as "Tokens: 13". Below this, another entry from "Qwen3-8B | 硅基流动" at the same timestamp shows the result of the search: "CS404_Assignment2 : top_games_by_approval". The response text states: "Here is a list of the best-reviewed games based on their approval rate (all games have a 100% approval rate, as indicated by the `approval_rate` field):". The results are presented in a numbered list:

1. **Azazel's Christmas Fable**
 - **approval_rate:** 1.0000
 - **Developer:** Greg Muhlbock
 - **Publisher:** Greg Muhlbock
 - **Release Date:** 2022-11-29
 - **Price (Original):** \$6.29
 - **Discount:** 30%
 - **Positive Reviews:** 112
 - **Negative Reviews:** 0
2. **ECHOLOCATION**
 - **approval_rate:** 1.0000
 - **Developer:** ハコニワハコビヤ (Hakoniwa Hakobiya)
 - **Publisher:** PortalKey
 - **Release Date:** 2021-03-24
 - **Price (Original):** \$3.99
 - **Discount:** 20%
 - **Positive Reviews:** 91
 - **Negative Reviews:** 0
3. **Wanting Wings**
 - **approval_rate:** 1.0000
 - **Developer:** BaseSon
 - **Publisher:** MangaGamer
 - **Release Date:** 2023-12-14
 - **Price (Original):** \$19.24
 - **Discount:** 0%
 - **Positive Reviews:** 90
 - **Negative Reviews:** 0

图 14: Qwen3-8B: top approval-rate games using `top_games_by_approval`.

- 4. **Projected Dreams**
 - **approval_rate:** 1.0000
 - **Developer:** Flawberry Studio
 - **Publisher:** Flawberry Studio
 - **Release Date:** 2025-05-29
 - **Price (Original):** \$11.24
 - **Discount:** 0%
 - **Positive Reviews:** 86
 - **Negative Reviews:** 0
- 5. **Reborn A Zombie!**
 - **approval_rate:** 1.0000
 - **Developer:** Asminae
 - **Publisher:** Asminae
 - **Release Date:** 2023-08-07
 - **Price (Original):** \$0.00
 - **Discount:** 0%
 - **Positive Reviews:** 82
 - **Negative Reviews:** 0
- 6. **Firebird**
 - **approval_rate:** 1.0000
 - **Developer:** Ludogram, FibreTigre, Quentin Vijoux
 - **Publisher:** Ludogram
 - **Release Date:** 2023-08-02
 - **Price (Original):** \$11.99
 - **Discount:** 0%
 - **Positive Reviews:** 82
 - **Negative Reviews:** 0
- 7. **SONOKUNI**
 - **approval_rate:** 1.0000
 - **Developer:** DON YASA CREW
 - **Publisher:** Kakehashi Games
 - **Release Date:** 2025-03-24
 - **Price (Original):** \$9.74
 - **Discount:** 0%
 - **Positive Reviews:** 81
 - **Negative Reviews:** 0

图 15: Qwen3-8B: top approval-rate games using `top_games_by_approval`.

```

8. Bahamut and the Waqwaq Tree
  • approval_rate: 1.0000
  • Developer: Starvania Studio
  • Publisher: Soft Source
  • Release Date: 2025-05-08
  • Price (Original): $14.99
  • Discount: 0%
  • Positive Reviews: 75
  • Negative Reviews: 0

9. Monster Meals
  • approval_rate: 1.0000
  • Developer: Giant Warrior Studio
  • Publisher: GoGo Games Interactive
  • Release Date: 2025-01-17
  • Price (Original): $1.39
  • Discount: 80%
  • Positive Reviews: 71
  • Negative Reviews: 0

10. COSPLAY LOVE! : Enchanted princess
  • approval_rate: 1.0000
  • Developer: Confiture, NEXD, iMel
  • Publisher: iMel
  • Release Date: 2022-03-30
  • Price (Original): $5.99
  • Discount: 0%
  • Positive Reviews: 62
  • Negative Reviews: 0

All ten games listed above have a perfect 1.0000 approval rate, indicating that they received only positive reviews. These games are potentially niche or indie titles, as the approval rate is consistently 100% and the publishers/developers are from different platforms (e.g., Mac or Linux). I can refine the search.

```

图 16: Qwen3-8B: top approval-rate games using `top_games_by_approval`.

Q5 whether large discounts are more common in older games, or whether newer games also receive significant discounts.



图 17: Qwen3-8B: discount trend analysis using `search_game`.

Evaluation (Qwen3-8B). Qwen3-8B was able to use MCP tools and provide database-grounded answers, but compared to GLM-4.5-Flash it was **more verbose** and occasionally less consistent in tool usage. In most queries (yearly trend, Linux comparison, publisher ranking, approval-rate ranking), it successfully invoked the intended tools and explained results based on returned aggregates. When the tool call succeeded, the answers remained faithful to the data and included reasonable interpretations. However, Qwen3-8B showed slightly weaker robustness if the database is lack of relative data, the Qwen3-8B is broken down.

5 Reflections and Conclusions

This assignment demonstrates a complete pipeline from raw dataset preparation to an MCP-enabled analytical interface.

Database design trade-offs. I used a single-table schema to maximize query robustness under LLM tool calling. This avoided complex joins and reduced the probability of generating incorrect SQL. The trade-off is reduced normalization for multi-value fields, but is acceptable for this assignment’s filtering and aggregation goals.

Data quality and preprocessing lessons. Real-world scraped datasets often contain missing values, placeholder values (e.g., 0-0), and inconsistent types. The most important step was enforcing consistent parsing rules (DATE/DECIMAL/INT/boolean flags) and ensuring missing values are stored as `NULL`. I also learned that multilingual text requires end-to-end encoding consistency: `utf8mb4` must be set at the database, connection, and query levels to prevent non-ASCII characters from becoming `?`.

Tool design lessons. Tools should be designed around stable, reusable query patterns. I found it helpful to provide (1) a general filtering tool (`search_game`) as the entry point, (2) a primary-key tool (`get_game_by_app_id`) for verification, and (3) a small set of focused aggregation and comparison tools for common analysis tasks.

Client integration. Configuring Cherry Studio to launch the MCP server in a consistent working directory was crucial. Once configured, both

GLM-4.5-Flash and Qwen3-8B were able to invoke tools and obtain structured results, validating the MCP pipeline across two different models.

In conclusion, the final system successfully supports database reasoning via MCP: the dataset is structured for efficient querying, the tools expose reliable analysis primitives, and two different LLMs can use those tools to answer non-trivial analytical questions with evidence from MySQL.